

## What is claimed is:



- 1. A method for manufacturing and analyzing a semiconductor die, the method comprising:
- forming a plurality of heating elements in the die;
- while operating the die, selectively controlling the heating elements and therein
- 5 causing at least one of the heating elements to heat at least one adjacent portion of the
- 6 die; and
- 7 analyzing the die via the operation.
- 1 2. The method of claim 1, wherein operating the die includes running a test pattern
- 2 on a portion of the die suspected to cause a failure.
- 1 3. The method of claim 1, wherein operating the die includes electrically coupling
- 2 the die to a signal generator adapted to supply test signals to the die.
- 1 4. The method of claim 1, further including detecting that the die is
- 2 malfunctioning.
- 1 5. The method of claim 4, further comprising:
- 2 identifying the portion of the die being heated at the time that a malfunction is
- 3 detected; and
- correlating the portion of the die being heated to a critical timing path.

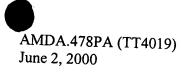
- 1 6. The method of claim 5, further comprising probing direcuitry in the critical
- 2 timing path and determining therefrom the nature of a defect.
- 1 7. The method of claim 1, wherein the die includes at least one of: a flip-chip
- 2 bonded die and a wire-bonded die.
- 1 8. The method of claim 1, further comprising selectively controlling the heating
- 2 elements and therein causing at least one of the heating elements to draw power in a
- manner that slows the operation of circuitry in at least one adjacent portion of the die.
- 1 9. The method of claim 1, further comprising electrically coupling the die to a
- 2 package, wherein selectively controlling the heating elements includes applying an
- 3 electrical signal to the heating elements via the electrical coupling to the package.
- 1 10. The method of claim 1, wherein selectively controlling the heating elements
- 2 includes causing a portion of the die to heat to a selected temperature.
- 1 11. The method of claim 1, wherein selectively controlling the heating elements
- 2 includes heating a plurality of the heating elements in a selected sequence.
- 1 12. The method of claim 1, wherein selectively controlling the heating elements
- 2 includes causing at least two of the heating elements to generate heat, and wherein the
- 3 at least two of the heating elements are located sufficiently distant from each other so

- 4 that heat from one of the elements does not interfere with heat from another one of the
- 5 elements in causing the die to heat.
- 1 13. The method of claim 1, wherein selectively controlling the heating elements
- 2 includes causing the at least one heating element to generate pulses of heat.
- 1 14. The method of claim 1, wherein selectively controlling the heating elements
- 2 comprises:
- grouping the heating elements into selected groups, each group having two or
- 4 more heating elements;
- 5 causing the selected groups to heat in a sequence;
- detecting a response from the die that indicates that the die is operating
- 7 defectively; and
- 8 in response to detecting the defective operation, identifying the selected group
- being caused to heat when the response is detected; and
- selectively operating individual heating elements of the selected group.
- 1 15. The method of claim 1, wherein selectively controlling the heating elements
- 2 comprises:
- detecting a temperature characteristic related to the heated portion of the die;
- 4 and
- in response to the detected temperature characteristic, controlling the heating via
- 6 a feedback loop.

- 1 16. The method of claim 15, further comprising forming a temperature sensor in the
- die, wherein detecting a temperature characteristic includes detecting the temperature of
- a portion of the die using the temperature sensor.

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- 1 (17) The method of claim 16, wherein forming a plurality of heating elements
- 2 includes forming a transistor having a gate, and wherein forming the temperature sensor
- 3 includes electrically coupling the temperature sensor to provide feedback to bias the
- 4 gate, and therein regulate the current through the transistor and control the heat
- <sup>6</sup>5 generated.
  - 1 18. The method of claim 1 wherein selectively controlling the heating elements
  - 2 comprises:
- 3 electrically coupling the heating elements to a heat controller; and
- supplying a signal from the controller to the heating elements and thereby
- 5 controlling the heating elements.
- 1 19. The method of claim 1, further comprising forming a control register in the die,
- 2 wherein selectively controlling the heating elements includes using the control register.
- 1 20. The method of claim 19, wherein selectively controlling the heating elements
- 2 includes providing a serial signal to the control register and using decoding and lookup



- 3 blocks at the control register to interpret the signal and activate one or more heating
- 4 elements based on the interpreted signal.
- 1 21. The method of claim 1, wherein forming a plurality of heating elements in the
- die includes forming a grid of heating elements.
- 1 22. A system for analyzing a semiconductor die having a plurality of heating
- 2 elements formed therein, the system comprising:
- control means for selectively causing at least one of the heating elements to
- 4 generate heat and to heat a portion of the die therefrom;
- 5 operating means for operating the die; and
- detection means for detecting a response from the die.
- 1 23. A system for analyzing a semiconductor die having a plurality of heating
- 2 elements formed therein/the system comprising:
- a controller adapted to selectively cause at least one of the heating elements to
- 4 heat at least one adjacent portion of the die;
- a testing device adapted to operate the die; and
- a detector adapted to detect a response from the die.
- 1 24. The system of claim 23, wherein the testing device and the controller are
- 2 included in a single testing arrangement.

- 1 25. The system of claim 23, wherein each heating element includes at least one of:
- 2 resistive metal, a transistor, a diode, doped metal and a polysilicon trace.
- 1 26. The system of claim 23, wherein the die further comprises a temperature sensor
- 2 formed therein and adapted to provide temperature feedback, and wherein the controller
- 3 is further communicatively coupled to receive the temperature feedback and to control
- 4 the heating in response thereto.
- 1 27. The system of claim 23, further comprising a stage to hold the die and
- 2 electrically couple the die to the testing device.
- 1 28. The system of claim 23, further comprising a computer communicatively
- 2 coupled to the tester and adapted to control the tester.
- 1 29. The system of claim 28, wherein the computer is further communicatively
- 2 coupled to the controller and adapted to direct the controller's operation.
- 1 30. The system of claim 23, wherein the detector and the testing device are included
- 2 in a single arrangement.
- 1 31. The system of claim 30, further comprising a computer communicatively
- 2 coupled to the controller, the testing device, and the detector, and wherein the computer

- 3 is adapted to control the analysis of the die and to provide response results from
- 4 analysis for review by a user.